

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference LU6079/Doe	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/14447	International filing date (day/month/year) 18.12.2003	Priority date (day/month/year) 20.12.2002
International Patent Classification (IPC) or both national classification and IPC B01J31/22		
Applicant BASELL POLYOLEFINE GMBH et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 01.07.2004	Date of completion of this report 01.04.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Bork, A-M Telephone No. +49 89 2399-8311 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 03/14447**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-57 as originally filed

Claims, Numbers

1-10 as originally filed

11-13 received on 03.12.2004 with letter of 30.11.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-13
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/14447

Re Item V

The following documents will be mentioned in this written opinion:

D1: WO-A-01 12641

D2: WO-A-01 92346

Present application complies with the requirement of unity of invention in accordance with Rules 13.1, 13.2, 13.3 PCT. The compound of example 6 of D1, cited as reason for non-unity objection in the International Search Report, falls not within the scope of present claim 1.

Novelty

D1 discloses monocyclopentadienyl complexes having a heteroaromatic ring directly bound to the cyclopentadienyl ring (see examples 6-10) and used as catalyst for the polymerization of olefines.

The complexes of the present application are different from those disclosed in D1 in that the heteroaromatic ring is bound to the cyclopentadienyl system through a divalent bridge $L^{1B}R^{1B}R^{2B}$, wherein L^{1B} is a carbon or a silicium atom.

D1 also indicates as preferred compounds, without giving specific examples, those having as bridge a CH_2 , $C(CH_3)_2$ or $Si(CH_3)_2$ divalent radical bound to a 2-pyridyl or 8-quinolyl, (see page 8, lines 43-47). The compounds of the present application are different from these suggested compounds through one substituent of the divalent bridge $L^{1B}R^{1B}R^{2B}$, namely R^{1B} is not a H or a C1-alkyl.

D2 discloses catalyst precursors for use in olefin polymerization reaction. The monocyclopentadienyl complexes of D2 (see examples 1-7) have a heteroaromatic ring bound to the cyclopentadienyl ring through a methylene bridge.

The complexes of the present application are different from the complexes of D2 in that the methylene bridge is further substituted.

In view of documents D1 and D2 the subject-matter of the claims according to claims 1-13 can be regarded as novel and meet the requirements of Art. 33(1) and (2) PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/14447

Inventive Step

D2 is to be considered as the closest prior art and in view of its contents the technical problem to be solved by the present application may be regarded as providing alternative monocyclopentadienyl complexes for use as catalysts for olefin polymerization. The solution of this problem provided by the present application are the claimed monocyclopentadienyl complexes according to claims 1-7 with said distinguishing feature (substituted methylene bridge).

Claims 1-7 are not supported by the description as required by Article 6 PCT, as their scope is broader than justified by the description and examples. The reasons therefor are the following:

Based on the world wide accepted postulate that the catalytic properties of a compound are considered to be unexpected by the skilled person, the generalisation of examples in this specific field is high speculative.

Since the only example of the present application for which a technical effect was shown (a better rate of comonomer incorporation using a catalyst of the application vs. a compound with an unsubstituted methylene bridge) relates to a chromium complex in which Cp= indenyl, L^{1B} = carbon, R^{1B} = a C4-alkenyl and R^{2B} = C1-alkyl (see example 5), that cannot justify the **broad** definition of catalyst complexes of claims 1-7.

An inventive step for the catalysts comprising ligands which are not supported by way of examples could be recognised only after the submission of further technical evidence that the claimed compositions individually solve a technical problem or provide a technical effect.

Therefore, the subject-matter of claims 1-13 is not considered to meet the requirements of Article 6 in combination with Article 33(3) PCT.

The catalyst described in example 5 of the present application meet the requirements of Article 33(3) PCT.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP 03/14447

Certain published documents (Rule 70.10)

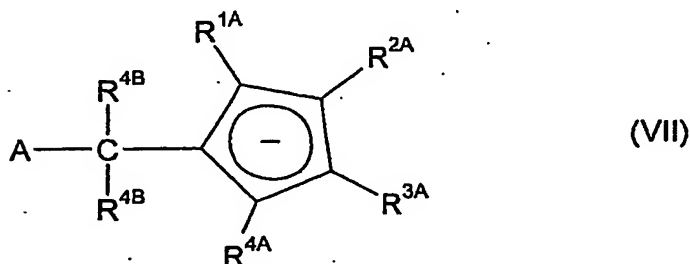
Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO-A-03 024982 =D3	27.03.2003	10.09.2002	14.09.2001

Document **D3** may constitute prior art in the national/regional phase of the present international application.

Other matters

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.
2. The compounds of example 1 and 2, do not fall in the scope of the application insofar the bridge is a not substituted $-\text{CH}_2-$ (in example 1) or is a $-\text{C}(\text{CH}_3)_2-$ bridge (in example 2).

11. A process for preparing polyolefins by polymerization or copolymerization of olefins in the presence of a catalyst system as claimed in claim 8 or 9.
12. A process for preparing cyclopentadienyl system anions of the formula (VII),



where the variables have the following meanings:

R^{1A} - R^{4A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 where the organic radicals R^{1A} - R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A} - R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A} - R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

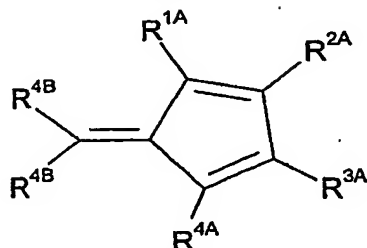
A is an unsubstituted, substituted or fused, heteroaromatic ring system,

R^{4B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radicals R^{4B} may also be substituted by halogens and two geminal or vicinal radicals R^{4B} may also be joined to form a five- or six-membered ring and

R^{3B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the step a) or a'), where,

in step a), an A^- anion is reacted with a fulvene of the formula (VIIIa)



(VIIIa)

or,

in step a'), an organometallic compound $R^{4B}M^BX^B$, where

M^B is a metal of group 1 or 2 of the Periodic Table of the Elements,

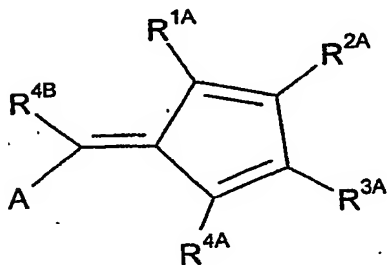
X^B is halogen, C_1-C_{10} -alkyl, alkoxy having from 1 to 20 carbon atoms in the alkyl radical and/or from 6 to 20 carbon atoms in the aryl radical, or R^{2B} ,

R^{2B} is hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radical R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring and

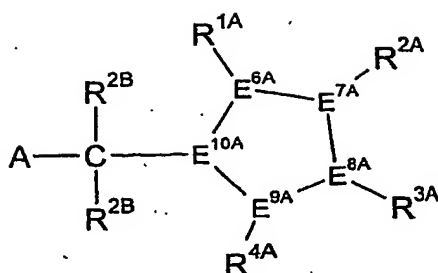
b is 0 when M^B is a metal of group 1 of the Periodic Table of the Elements and is 1 when M^B is a metal of group 2 of the Periodic Table of the Elements,

is reacted with a fulvene of the formula (VIIIb):



(VIIIb)

13. A process for preparing cyclopentadiene systems of the formula (VIIa)



(VIIa)

where the variables have the following meanings:

$E^{6A}-E^{10A}$ are each carbon, where in each case four adjacent $E^{6A}-E^{10A}$ form a conjugated diene system and the remaining $E^{6A}-E^{10A}$ additionally bears a hydrogen atom,

$R^{1A}-R^{4A}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , where the organic radicals $R^{1A}-R^{4A}$ may also be substituted by halogens and two vicinal radicals $R^{1A}-R^{4A}$ may also be joined to form a five- or six-membered ring, and/or two vicinal radicals $R^{1A}-R^{4A}$ are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

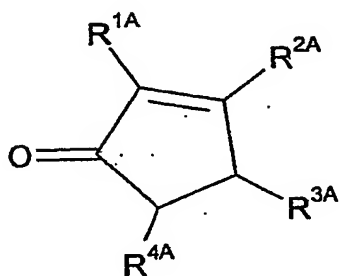
A is an unsubstituted, substituted or fused, heteroaromatic ring system,

R^{2B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radicals R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the following step:

a'') reaction of an $A-CR^{2B}R^{2B-}$ anion with a cyclopentenone system of the formula (IX)



(IX)